1

2   What is claimed is:

3   1.   In a computer network having a plurality of nodes for interacting with computer

4   network information, a system for managing said plurality of nodes comprising:

5   means for establishing a DDB in each of said nodes; and,

6   means for controlling contents of each said DDB to be substantially identical to

7   contents of every other said DDB and in a manner to avoid a single point of failure.

8

9   2.   The system of claim 1 and wherein:

10   said computer network information comprises both computer data and domain

11   configuration status, and said each of said nodes has a unique IP address; and,

12   said DDB establishing means further comprises:

13   means for associating each said unique IP address with its respective node

14   to provide an IP-address-respective-node association;

15   means for combining said association for said each of said nodes into a

16   network IP association; and,

17   means for distributing said network IP association to said DDB in each of

18   said nodes; and,

19   said contents controlling means further comprises:

20   means for maintaining the most current of said domain configuration

21   status in said DDB in each of said nodes.

22

1   3.   The system of claim 1 and wherein said interacting includes receiving, storing,

2   modifying, and transmitting.

3

4   4.   The system of claim 2 and wherein said controlling means further comprises:

5   means for selecting one of said plurality of nodes as a master node;

6   means for subordinating all other of said plurality of nodes to said master node in

7   a configuration defined by said master node and said all other of said plurality of nodes;

8   and,

9   said master node including means for responding to a change to said domain

10   configuration status in a manner to maintain said contents of each said DDB substantially

11   identical to said contents of every other DDB.

12

13   5.   The system of claim 4 and wherein said controlling means further comprises:

14   means for replacing said master node with another node if said master node fails.

15

16   6.   The system of claim 5 and wherein said master node replacing means includes

17   means for replacing said master node with another node selected from said configuration.

18

19   7.   The system of claim 4 and wherein said change to said domain configuration

20   status is selected from the group of changes consisting of: adding a first node to said

21   configuration; deleting a second node from said configuration; a third node failing in said

22   configuration; and, a network link failing between a fourth node in said configuration and

23   said master node.

1

2   8.   The system of claim 7 and wherein said computer network is a client-server

3   network having a graphical user interface and wherein said selecting means further

4   comprises:

5   means, utilizing said graphical user interface, for invoking a select master dialog

6   by which said user can select said one of said plurality of nodes.

7

8   9.   The system of claim 5 and wherein said computer network is a client-server

9   network having a graphical user interface and wherein said replacing means further

10   comprises:

11   means, utilizing said graphical user interface, for invoking a select master dialog

12   by which said user can select said another node.

13

14   10.   The system of claim 7 and wherein said responding means further comprises:

15   first means for handling said third node failing under conditions in which said

16   master node is known to said third node; and,

17   second means for handling said third node failing under conditions in which said

18   master node is unknown to said third node.

19

20   11.   The system of claim 10 and wherein said first means further comprises:

21   means for establishing version numbers to identify versions of said DDB in each

22   of said plurality of nodes;

1   means, employed by each of said all other of said plurality of nodes, for

2   continuously polling said master node at regular intervals to obtain the most current one

3   of said version numbers of the DDB in said master node;

4   means employed by said master node, responsive to said polling received from

5   said third node after recovery of said third node, for sending said most current one of said

6   version numbers to said third node; and

7   means for updating the DDB in said third node if said most current one of said

8   version numbers does not match the version number of said DDB in said third node.

9

10   12.   The system of claim 11 and wherein said third node DDB updating means

11   includes means for handshaking between said master node and said third node.

12

13   13.   The system of claim 10 and wherein said conditions in which said master node is

14   unknown to said third node include both said third node failing while it is being added to

15   said configuration and said master node was replaced during time of failure of said third

16   node.

17

18   14.   The system of claim 13 and wherein said second means further comprises:

19   means, employed by said master node, for repetitively pinging said third node at

20   predetermined intervals until said third node recovers and sends a recovery signal to said

21   master node; and,

22   said master node including means, responsive to said recovery signal, for

23   updating the DDB in said third node as may be needed.

1

2 15.   The system of claim 14 and wherein said third node DDB updating means

3 includes means for handshaking between said master node and said third node.

4

5 16.   The system of claim 7 and wherein said responding means further comprises:

6   means for handling said network link failing.

7

8 17.   The system of claim 16 and wherein said network link failing handling means

9 further comprises:

10   means for establishing version numbers to identify versions of said DDB in each

11 of said plurality of nodes;

12   means, employed by each of said all other of said plurality of nodes, for

13 continuously polling said master node at regular intervals to obtain the most current one

14 of said version numbers of the DDB in said master node;

15   means employed by said master node, responsive to said polling received from

16 said fourth node after recovery of said network link, for sending said most current one of

17 said version numbers to said fourth node; and,

18   means for updating the DDB in said fourth node if said most current one of said

19 version numbers does not match the version number of said DDB in said fourth node.

20

21 18.   The system of claim 17 and wherein said fourth node DDB updating means

22 includes means for handshaking between said master node and said fourth node.

23

1 19. The system of claim 7 and wherein said responding means further comprises:

2   means for handling said adding a first node to said configuration.

3

4 20. The system of claim 19 and wherein said first node adding handling means

5 comprises:

6   means for determining if said first node is being added through said master node

7 to obtain a master-added node or through one of said all other of said plurality of nodes to

8 obtain a portal-added node.

9

10 21. The system of claim 20 and wherein said determining means, for the condition of

11 said master-added node, further comprises:

12   said master node including means for updating the DDB in said master node with

13 the IP address of said first node and for informing said first node that the first node's

14 master is said master node;

15   said first node including means, responsive to operation of said informing means,

16 for entering the IP address of said master node in the DDB of said first node and for

17 acknowledging said master node; and,

18   said master node including means for sending said IP address of said first node as

19 an update to all other nodes in said configuration.

20

21 22. The system of claim 21 and wherein said IP address sending means further

22 comprises:

1   means for performing a master to node handshake between said master node and

2 said all other nodes in said configuration.

3

4 23.   The system of claim 20 and wherein said determining means, for the condition of

5 said portal-added node, further comprises:

6   a cache memory included in said portal node;

7   means for holding the IP address of said first node in said cache memory;

8   means for performing a node to master handshake between said first node and

9 said master node;

10   said portal node including means for informing said master node of the IP address

11 of said first node;

12   said master node including means for updating the DDB in said master node with

13 the IP address of said first node and for informing said first node that the first node's

14 master is said master node;

15   said first node including means, responsive to operation of said informing means,

16 for entering the IP address of said master node in the DDB of said first node and for

17 acknowledging said master node; and,

18   said master node including means for sending said IP address of said first node as

19 an update to all other nodes in said configuration.

20

21 24.   The system of claim 23 and wherein said IP address sending means further

22 comprises:

1   means for performing a master to node handshake between said master node and

2   said all other nodes in said configuration.

3

4   25.   The system of claim 8 and wherein said responding means further comprises:

5   means for handling said deleting a second node from said plurality of nodes.

6

7   26.   The system of claim 25 and wherein said second node deleting handling means

8   further comprises:

9   means, utilizing said graphical user interface, for removing said second node from

10   said configuration;

11   means for determining if said second node is removed through said master node;

12   means, responsive to operation of said determining means removing said second

13   node through said master node, for:

14   (1) updating the DDB in said master node by removing the IP address of

15   said second node from the DDB of said master node;

16   (2) informing said second node that said configuration no longer includes

17   said second node and detaching said second node from said configuration;

18   (3) erasing all contents of the DDB of said second node; and,

19   (4) sending an update to all remaining nodes in said configuration.

20

21   27.   The system of claim 26 and wherein said update sending means further

22   comprises:

1   means for performing a master to node handshake between said master node and

2   said all remaining nodes in said configuration.

3

4   28.   The system of claim 25 and wherein said second node deleting handling means

5   further comprises:

6   means, utilizing said graphical user interface, for removing said second node from

7   said configuration;

8   means for selecting a portal-removal node other than said master node through

9   which to remove said second node from said configuration;

10   a cache memory included in said portal-removal node;

11   means for determining if said second node is removed through said master node;

12   means, responsive to operation of said determining means removing said second

13   node through said portal-removal node and not through said master node, for:

14   (1) storing the IP address of said second node in said cache;

15   (2) performing a node to master handshake between said portal-removal

16   node and said master node;

17   (3) informing said master node to remove the IP address of said second

18   node from the DDB of said master node;

19   (4) updating the DDB in said master node by removing the IP address of

20   said second node from the DDB of said master node;

21   (5) informing said second node that said configuration no longer includes

22   said second node and detaching said second node from said configuration;

23   (6) erasing all contents of the DDB of said second node; and,

1   (7) sending an update to all remaining nodes in said configuration.

2

3   29.   The system of claim 28 and wherein said update sending means further

4   comprises:

5   means for performing a master to node handshake between said master node and

6   said all remaining nodes in said configuration.

7

8   30.   The system of claim 22 or 24 and wherein said master to node handshake

9   performing means comprises for each one of said all other nodes in said configuration:

10   first deciding means for deciding if the IP address of said master node in said

11   update matches the IP address of said master node contained in the DDB of said each one

12   of said all other nodes in said configuration;

13   means, responsive to operation of said first deciding means deciding no match, for

14   rejecting said update and logging said event;

15   second deciding means, responsive to operation of said first deciding means

16   deciding a match, for deciding if the version number of the DDB in said master node

17   before said update matches the version number of said DDB of said each one of said all

18   other nodes in said configuration before said update;

19   means, responsive to operation of said second deciding means deciding no match,

20   for accepting a completely updated DDB with updated version number from said master

21   node; and,

22   means, responsive to operation of said second deciding means deciding a match,

23   for accepting only said update with said updated version number from said master node.

1

2   31.   The system of claim 27 or 29 and wherein said master to node handshake

3   performing means comprises for each one of said all remaining nodes in said

4   configuration:

5   first deciding means for deciding if the IP address of said master node in said

6   update matches the IP address of said master node contained in the DDB of said each one

7   of said all remaining nodes in said configuration;

8   means, responsive to operation of said first deciding means deciding no match, for

9   rejecting said update and logging said event;

10   second deciding means, responsive to operation of said first deciding means

11   deciding a match, for deciding if the version number of the DDB in said master node

12   before said update matches the version number of said DDB of said each one of said all

13   remaining nodes in said configuration;

14   means, responsive to operation of said second deciding means deciding no match,

15   for accepting a completely updated DDB with updated version number from said master

16   node; and,

17   means, responsive to operation of said second deciding means deciding a match,

18   for accepting only said update with said updated version number from said master node.

19

20

21   32.   A computer program product for use in a computer network having a plurality of

22   nodes for interacting with computer network information, said computer program product

1   including a computer usable medium having computer readable program code thereon for

2   managing said plurality of nodes, said program code comprising:

3   program code for establishing a DDB in each of said nodes; and,

4   program code for controlling contents of each said DDB to be substantially

5   identical to contents of every other said DDB and in manner to avoid a single point of

6   failure.

7

8   33.   The computer program product of claim 32 and wherein:

9   said computer network information comprises both computer data and domain

10 configuration status, and said each of said nodes has a unique IP address; and,

11   said DDB establishing program code further comprises:

12   program code for associating each said unique IP address with its

13   respective node to provide an IP-address-respective-node association;

14   program code for combining said association for said each of said nodes

15   into a network IP association; and,

16   program code for distributing said network IP association to said DDB in

17   each of said nodes; and,

18   said contents controlling program code further comprises:

19   program code for maintaining the most current of said domain

20   configuration status in said DDB in each of said nodes.

21

22 34.   The computer program product of claim 32 and wherein said interacting includes

23 receiving, storing, modifying, and transmitting.

1

2   35.   The computer program product of claim 33 and wherein said controlling program

3   code further comprises:

4   program code for selecting one of said plurality of nodes as a master node;

5   program code for subordinating all other of said plurality of nodes to said master

6   node in a configuration defined by said master node and said all other of said plurality of

7   nodes; and,

8   said master node including program code for responding to a change to said

9   domain configuration status in a manner to maintain said contents of each said DDB

10   substantially identical to said contents of every other DDB.

11

12   36.   The computer program product of claim 35 and wherein said controlling program

13   code further comprises:

14   program code for replacing said master node with another node if said master

15   node fails.

16

17   37.   The computer program product of claim 36 and wherein said master node

18   replacing program code includes program code for replacing said master node with

19   another node selected from said configuration.

20

21   38.   The computer program product of claim 35 and wherein said change to said

22   domain configuration status is selected from the group of changes consisting of: adding a

23   first node to said configuration; deleting a second node from said configuration; a third

1   node failing in said configuration; and, a network link failing between a fourth node in

2   said configuration and said master node.

3

4   39.   The computer program product of claim 38 and wherein said computer network is

5   a client-server network having a graphical user interface and wherein said selecting

6   program code further comprises:

7   program code, utilizing said graphical user interface, for invoking a select master

8   dialog by which said user can select said one of said plurality of nodes.

9

10   40.   The computer program product of claim 36 and wherein said computer network is

11   a client-server network having a graphical user interface and wherein said replacing

12   program code further comprises:

13   program code, utilizing said graphical user interface, for invoking a select master

14   dialog by which said user can select said another node.

15

16   41.   The computer program product of claim 38 and wherein said responding program

17   code further comprises:

18   first program code for handling said third node failing under conditions in which

19   said master node is known to said third node; and,

20   second program code for handling said third node failing under conditions in

21   which said master node is unknown to said third node.

22

1   42.   The computer program product of claim 41 and wherein said first program code

2   further comprises:

3   program code for establishing version numbers to identify versions of said DDB

4   in each of said plurality of nodes;

5   program code, employed by each of said all other of said plurality of nodes, for

6   continuously polling said master node at regular intervals to obtain the most current one

7   of said version numbers of the DDB in said master node;

8   program code employed by said master node, responsive to said polling received

9   from said third node after recovery of said third node, for sending said most current one

10   of said version numbers to said third node; and

11   program code for updating the DDB in said third node if said most current one of

12   said version numbers does not match the version number of said DDB in said third node.

13

14   43.   The computer program product of claim 42 and wherein said third node DDB

15   updating program code includes program code for handshaking between said master node

16   and said third node.

17

18   44.   The computer program product of claim 41 and wherein said conditions in which

19   said master node is unknown to said third node include both said third node failing while

20   it is being added to said configuration and said master node was replaced during time of

21   failure of said third node.

22

1   45.   The computer program product of claim 44 and wherein said second program

2   code further comprises:

3   program code, employed by said master node, for repetitively pinging said third

4   node at predetermined intervals until said third node recovers and sends a recovery signal

5   to said master node; and,

6   said master node including program code, responsive to said recovery signal, for

7   updating the DDB in said third node as may be needed.

8

9   46.   The computer program product of claim 45 and wherein said third node DDB

10   updating program code includes program code for handshaking between said master node

11   and said third node.

12

13   47.   The computer program product of claim 38 and wherein said responding program

14   code further comprises:

15   program code for handling said network link failing.

16

17   48.   The computer program product of claim 47 and wherein said network link failing

18   handling program code further comprises:

19   program code for establishing version numbers to identify versions of said DDB

20   in each of said plurality of nodes;

21   program code, employed by each of said all other of said plurality of nodes, for

22   continuously polling said master node at regular intervals to obtain the most current one

23   of said version numbers of the DDB in said master node;

1   program code employed by said master node, responsive to said polling received

2   from said fourth node after recovery of said network link, for sending said most current

3   one of said version numbers to said fourth node; and,

4   program code for updating the DDB in said fourth node if said most current one

5   of said version numbers does not match the version number of said DDB in said fourth

6   node.

7

8   49.   The computer program product of claim 48 and wherein said fourth node DDB

9   updating program code includes program code for handshaking between said master node

10 and said fourth node.

11

12 50.   The computer program product of claim 38 and wherein said responding program

13 code further comprises:

14   program code for handling said adding a first node to said configuration.

15

16 51.   The computer program product of claim 50 and wherein said first node adding

17 handling program code comprises:

18   program code for determining if said first node is being added through said master

19 node to obtain a master-added node or through one of said all other of said plurality of

20 nodes to obtain a portal-added node.

21

22 52.   The computer program product of claim 51 and wherein said determining

23 program code, for the condition of said master-added node, further comprises:

1   said master node including program code for updating the DDB in said master

2   node with the IP address of said first node and for informing said first node that the first

3   node's master is said master node;

4   said first node including program code, responsive to operation of said informing

5   program code, for entering the IP address of said master node in the DDB of said first

6   node and for acknowledging said master node; and,

7   said master node including program code for sending said IP address of said first

8   node as an update to all other nodes in said configuration.

9

10   53.   The computer program product of claim 52 and wherein said IP address sending

11   program code further comprises:

12   program code for performing a master to node handshake between said master

13   node and said all other nodes in said configuration.

14

15   54.   The computer program product of claim 51 and wherein said determining

16   program code, for the condition of said portal-added node, further comprises:

17   a cache memory included in said portal node;

18   program code for holding the IP address of said first node in said cache memory;

19   program code for performing a node to master handshake between said first node

20   and said master node;

21   said portal node including program code for informing said master node of the IP

22   address of said first node;

1   said master node including program code for updating the DDB in said master

2   node with the IP address of said first node and for informing said first node that the first

3   node's master is said master node;

4   said first node including program code, responsive to operation of said informing

5   program code, for entering the IP address of said master node in the DDB of said first

6   node and for acknowledging said master node; and,

7   said master node including program code for sending said IP address of said first

8   node as an update to all other nodes in said configuration.

9

10   55.   The computer program product of claim 54 and wherein said IP address sending

11   program code further comprises:

12   program code for performing a master to node handshake between said master

13   node and said all other nodes in said configuration.

14

15   56.   The computer program product of claim 39 and wherein said responding program

16   code further comprises:

17   program code for handling said deleting a second node from said plurality of

18   nodes.

19

20   57.   The computer program product of claim 56 and wherein said second node

21   deleting handling program code further comprises:

22   program code, utilizing said graphical user interface, for removing said second

23   node from said configuration;

1   program code for determining if said second node is removed through said master

2   node;

3   program code, responsive to operation of said determining program code

4   removing said second node through said master node, for:

5   (1) updating the DDB in said master node by removing the IP address of

6   said second node from the DDB of said master node;

7   (2) informing said second node that said configuration no longer includes

8   said second node and detaching said second node from said configuration;

9   (3) erasing all contents of the DDB of said second node; and,

10   (4) sending an update to all remaining nodes in said configuration.

11

12   58.   The computer program product of claim 57 and wherein said update sending

13   program code further comprises:

14   program code for performing a master to node handshake between said master

15   node and said all remaining nodes in said configuration.

16

17   59.   The computer program product of claim 56 and wherein said second node

18   deleting handling program code further comprises:

19   program code, utilizing said graphical user interface, for removing said second

20   node from said configuration;

21   program code for selecting a portal-removal node other than said master node

22   through which to remove said second node from said configuration;

23   a cache memory included in said portal-removal node;

1   program code for determining if said second node is removed through said master

2   node;

3   program code, responsive to operation of said determining program code

4   removing said second node through said portal-removal node and not through said master

5   node, for:

6   (1) storing the IP address of said second node in said cache;

7   (2) performing a node to master handshake between said portal-removal

8   node and said master node;

9   (3) informing said master node to remove the IP address of said second

10   node from the DDB of said master node;

11   (4) updating the DDB in said master node by removing the IP address of

12   said second node from the DDB of said master node;

13   (5) informing said second node that said configuration no longer includes

14   said second node and detaching said second node from said configuration;

15   (6) erasing all contents of the DDB of said second node; and,

16   (7) sending an update to all remaining nodes in said configuration.

17

18   60.   The computer program product of claim 59 and wherein said update sending

19   program code further comprises:

20   program code for performing a master to node handshake between said master

21   node and said all remaining nodes in said configuration.

22

1   61.   The computer program product of claim 53 or 55 and wherein said master to node

2   handshake performing program code comprises for each one of said all other nodes in

3   said configuration:

4   first deciding program code for deciding if the IP address of said master node in

5   said update matches the IP address of said master node contained in the DDB of said each

6   one of said all other nodes in said configuration;

7   program code, responsive to operation of said first deciding program code

8   deciding no match, for rejecting said update and logging said event;

9   second deciding program code, responsive to operation of said first deciding

10   program code deciding a match, for deciding if the version number of the DDB in said

11   master node before said update matches the version number of said DDB of said each one

12   of said all other nodes in said configuration before said update;

13   program code, responsive to operation of said second deciding program code

14   deciding no match, for accepting a completely updated DDB with updated version

15   number from said master node; and,

16   program code, responsive to operation of said second deciding program code

17   deciding a match, for accepting only said update with said updated version number from

18   said master node.

19

20   62.   The computer program product of claim 58 or 60 and wherein said master to node

21   handshake performing program code comprises for each one of said all remaining nodes

22   in said configuration:

1　　　　first deciding program code for deciding if the IP address of said master node in

2　said update matches the IP address of said master node contained in the DDB of said each

3　one of said all remaining nodes in said configuration;

4　　　　program code, responsive to operation of said first deciding program code

5　deciding no match, for rejecting said update and logging said event;

6　　　　second deciding program code, responsive to operation of said first deciding

7　program code deciding a match, for deciding if the version number of the DDB in said

8　master node before said update matches the version number of said DDB of said each one

9　of said all remaining nodes in said configuration;

10　　　　program code, responsive to operation of said second deciding program code

11　deciding no match, for accepting a completely updated DDB with updated version

12　number from said master node; and,

13　　　　program code, responsive to operation of said second deciding program code

14　deciding a match, for accepting only said update with said updated version number from

15　said master node.

16

17　63.　　In a computer network having a plurality of nodes for interacting with computer

18　network information, a method for managing said plurality of nodes comprising:

19　　　　establishing a DDB in each of said nodes; and,

20　　　　controlling contents of each said DDB to be substantially identical to contents of

21　every other said DDB and in a manner to avoid a single point of failure.

22

23　64.　　The method of claim 63 and wherein:

1   said computer network information comprises both computer data and domain

2   configuration status, and said each of said nodes has a unique IP address; and,

3   said DDB establishing further comprises:

4   associating each said unique IP address with its respective node to provide

5   an IP-address-respective-node association;

6   combining said association for said each of said nodes into a network IP

7   association; and,

8   distributing said network IP association to said DDB in each of said nodes;

9   and,

10   said contents controlling further comprises:

11   maintaining the most current said domain configuration status in said

12   DDB in each of said nodes.

13

14   65.   The method of claim 63 and wherein said interacting includes receiving, storing,

15   modifying, and transmitting.

16

17   66.   The method of claim 64 and wherein said controlling further comprises:

18   selecting one of said plurality of nodes as a master node;

19   subordinating all other of said plurality of nodes to said master node in a

20   configuration defined by said master node and said all other of said plurality of nodes;

21   and,

1   responding to a change to said domain configuration status in a manner to

2   maintain said contents of each said DDB substantially identical to said contents of every

3   other DDB.

4

5   67.   The method of claim 66 and wherein said controlling further comprises:

6   replacing said master node with another node if said master node fails.

7

8   68.   The method of claim 67 and wherein said master node replacing includes

9   replacing said master node with another node selected from said configuration.

10

11   69.   The method of claim 66 and wherein said change to said domain configuration

12   status is selected from the group of changes consisting of: adding a first node to said

13   configuration; deleting a second node from said configuration; a third node failing in said

14   configuration; and, a network link failing between a fourth node in said configuration and

15   said master node.

16

17   70.   The method of claim 69 and wherein said computer network is a client-server

18   network having a graphical user interface and wherein said selecting further comprises:

19   utilizing said graphical user interface to invoke a select master dialog by which

20   said user can select said one of said plurality of nodes.

21

22   71.   The method of claim 67 and wherein said computer network is a client-server

23   network having a graphical user interface and wherein said replacing further comprises:

1   utilizing said graphical user interface to invoke a select master dialog by which

2   said user can select said another node.

3

4   72.   The method of claim 69 and wherein said responding further comprises:

5   first handling said third node failing under conditions in which said master node is

6   known to said third node; and,

7   second handling said third node failing under conditions in which said master

8   node is unknown to said third node.

9

10   73.   The method of claim 72 and wherein said first handling further comprises:

11   establishing version numbers to identify versions of said DDB in each of said

12   plurality of nodes;

13   each of said all other of said plurality of nodes continuously polling said master

14   node at regular intervals to obtain the most current one of said version numbers of the

15   DDB in said master node;

16   said master node, responsive to said polling received from said third node after

17   recovery of said third node, sending said most current one of said version numbers to said

18   third node; and

19   updating the DDB in said third node if said most current one of said version

20   numbers does not match the version number of said DDB in said third node.

21

22   74.   The method of claim 73 and wherein said third node DDB updating includes

23   handshaking between said master node and said third node.

1

2   75.   The method of claim 72 and wherein said conditions under which said master

3   node is unknown to said third node include both said third node failing while being added

4   to said configuration and said master node being replaced during time of failure of said

5   third node.

6

7   76.   The method of claim 75 and wherein said second handling further comprises:

8   said master node repetitively pinging said third node at predetermined intervals

9   until said third node recovers and sends a recovery signal to said master node; and,

10   said master node, responsive to said recovery signal, updating the DDB in said

11   third node as may be needed.

12

13   77.   The method of claim 76 and wherein said third node DDB updating includes

14   handshaking between said master node and said third node.

15

16   78.   The method of claim 69 and wherein said responding further comprises:

17   handling said network link failing.

18

19   79.   The method of claim 78 and wherein said network link failing handling further

20   comprises:

21   establishing version numbers to identify versions of said DDB in each of said

22   plurality of nodes;

1   each of said all other of said plurality of nodes continuously polling said master

2   node at regular intervals to obtain the most current one of said version numbers of the

3   DDB in said master node;

4   said master node, responsive to said polling received from said fourth node after

5   recovery of said network link, sending said most current one of said version numbers to

6   said fourth node; and,

7   updating the DDB in said fourth node if said most current one of said version

8   numbers does not match the version number of said DDB in said fourth node.

9

10   80.   The method of claim 79 and wherein said fourth node DDB updating includes

11   handshaking between said master node and said fourth node.

12

13   81.   The method of claim 69 and wherein said responding further comprises:

14   handling said adding a first node to said configuration.

15

16   82.   The method of claim 81 and wherein said first node adding handling comprises:

17   determining if said first node is being added through said master node to obtain a

18   master-added node or through one of said all other of said plurality of nodes to obtain a

19   portal-added node.

20

21   83.   The method of claim 82 and wherein said determining, for the condition of said

22   master-added node, further comprises:

1   said master node updating the DDB in said master node with the IP address of

2   said first node and informing said first node that the first node's master is said master

3   node;

4   said first node, responsive to said informing, entering the IP address of said

5   master node in the DDB of said first node and acknowledging said master node; and,

6   said master node sending said IP address of said first node as an update to all

7   other nodes in said configuration.

8

9   84.   The method of claim 83 and wherein said IP address sending further comprises:

10   performing a master to node handshake between said master node and said all

11   other nodes in said configuration.

12

13   85.   The method of claim 82 for the condition of said portal-added node, and wherein

14   said portal-added node includes a cache memory, said determining further comprising:

15   holding the IP address of said first node in said cache memory;

16   performing a node to master handshake between said first node and said master

17   node;

18   said portal node informing said master node of the IP address of said first node;

19   said master node updating the DDB in said master node with the IP address of

20   said first node and informing said first node that the first node's master is said master

21   node;

22   said first node, responsive to said informing, entering the IP address of said

23   master node in the DDB of said first node and acknowledging said master node; and,

1   said master node sending said IP address of said first node as an update to all

2 other nodes in said configuration.

3

4 86.   The method of claim 85 and wherein said IP address sending further comprises:

5   performing a master to node handshake between said master node and said all

6 other nodes in said configuration.

7

8 87.   The method of claim 70 and wherein said responding further comprises:

9   handling said deleting a second node from said plurality of nodes.

10

11 88.   The method of claim 87 and wherein said second node deleting handling further

12 comprises:

13   utilizing said graphical user interface to remove said second node from said

14 configuration;

15   determining if said second node is removed through said master node;

16   said determining, responsive to said utilizing removing said second node through

17 said master node, for:

18   (1) updating the DDB in said master node by removing the IP address of

19 said second node from the DDB of said master node;

20   (2) informing said second node that said configuration no longer includes

21 said second node and detaching said second node from said configuration;

22   (3) erasing all contents of the DDB of said second node; and,

23   (4) sending an update to all remaining nodes in said configuration.

1

2   89.   The method of claim 88 and wherein said update sending further comprises:

3   performing a master to node handshake between said master node and said all

4   remaining nodes in said configuration.

5

6   90.   The method of claim 87 and wherein said second node deleting handling further

7   comprises:

8   utilizing said graphical user interface to remove said second node from said

9   configuration;

10   selecting a portal-removal node other than said master node through which to

11   remove said second node from said configuration;

12   establishing a cache memory in said portal-removal node;

13   determining if said second node is removed through said master node;

14   said determining, responsive to said utilizing removing said second node through

15   said portal-removal node and not through said master node:

16   (1) storing the IP address of said second node in said cache;

17   (2) performing a node to master handshake between said portal-removal

18   node and said master node;

19   (3) informing said master node to remove the IP address of said second

20   node from the DDB of said master node;

21   (4) updating the DDB in said master node by removing the IP address of

22   said second node from the DDB of said master node;

1   (5) informing said second node that said configuration no longer includes

2   said second node and detaching said second node from said configuration;

3   (6) erasing all contents of the DDB of said second node; and,

4   (7) sending an update to all remaining nodes in said configuration.

5

6   91.   The method of claim 90 and wherein said update sending further comprises:

7   performing a master to node handshake between said master node and said all

8   remaining nodes in said configuration.

9

10   92.   The method of claim 84, 86, 89, or 91 and wherein said master to node handshake

11   performing comprises for each one of said all other nodes in said configuration:

12   deciding if the IP address of said master node in said update matches the IP

13   address of said master node contained in the DDB of said each one of said all other nodes

14   in said configuration;

15   if no IP address match, rejecting said update and logging said event;

16   if an IP address match, deciding if the version number of the DDB in said master

17   node before said update matches the version number in the DDB of said each one of said

18   all other nodes in said configuration before said update;

19   if no version number match, accepting a completely updated DDB with updated

20   version number from said master node; and,

21   if a version number match, accepting only said update with said updated version

22   number from said master node.

23

1

2   93.   In a computer network having a plurality of nodes each of which has a DDB and

3   one of which is a master node used to maintain contents of said DDB in each of said

4   plurality of nodes consistent throughout said plurality in a manner to avoid a single point

5   of failure, a system for handling failure of said master node comprising:

6   means for selecting another of said plurality of nodes as new master node if said

7   master node becomes a failed master node; and,

8   said new master node including means for advising each of said all other of said

9   plurality of nodes of identity and authority of said new master node.

10

11   94.   The system of claim 93 and wherein:

12   said selecting mean includes a GUI by which a global administrator can appoint

13   said new master node.

14

15   95.   The system of claim 94 and wherein said advising means comprises:

16   means for detecting failed and potentially failed nodes in said plurality of nodes;

17   and,

18   means for pinging each one of said failed and potentially failed nodes until said

19   each one of said failed and potentially failed nodes recovers into a recovered node ; and,

20   means for updating said contents of said DDB in said recovered node to match

21   said contents of said DDB of said new master node.

22

1 96. The system of claim 95 and wherein said updating means includes means for

2 handshaking between said new master node and said recovered node.

3

4 97. The system of claim 96 and wherein said failed nodes include said failed master

5 node and said potentially failed nodes include any other of said plurality of nodes having

6 a failed network link to said master node.

7

8

9 98. In a computer network having a plurality of nodes each of which has a DDB and

10 one of which is a master node used to maintain contents of said DDB in each of said

11 plurality of nodes consistent throughout said plurality in a manner to avoid a single point

12 of failure, a system for handshaking between an inquiring node of said plurality and said

13 master node comprising:

14   means for obtaining the address of a first node in said plurality presumed by said

15 inquiring node to be said inquiring node's master; and,

16   first means for determining from said first node if said first node is said inquiring

17 node's master.

18

19 99. The system of claim 98 and wherein said system further comprises:

20   second means, responsive to operation of said first means determining that said

21 first node is not said inquiring node's master, for inquiring of said first node who is new

22 master for said inquiring node; and,

1   third means responsive to operation of said second means determining said new

2   master, for providing address of said new master to said inquiring node.

3

4   100.   The system of claim 98 and wherein said computer network is controlled by a

5   global administrator acting through a GUI, said system further comprising:

6   fourth means, responsive to operation of said second means not determining said

7   new master, for deciding to request said global administrator to configure information

8   identifying said new master for said inquiring node; and

9   fifth means, responsive to operation of said fourth means deciding to request said

10   global administrator to configure information identifying said new master, for providing

11   such information to said inquiring node.

12

13   101.   The system of claim 100 and wherein said second means includes iteration means,

14   responsive to operation of said fourth means deciding not to request said global

15   administrator to configure information identifying said new master, for causing said

16   operation of said second means to repeat.

17

18   102.   The system of claim 98 and wherein said address is an IP address.

19

20

21   103.   In a computer network configuration having a plurality of nodes each of which

22   has a DDB, contents of said DDB including its respective DDB version number, and one

23   of which is a master node used to maintain said contents in each of said plurality of nodes

1   consistent throughout said plurality in a manner to avoid a single point of failure, a

2   system for initiating a master to node handshake as a function of said master node

3   undertaking to provide an update message including said address of said master node to

4   all other of said plurality of nodes in response to a change to said network configuration,

5   said DDB in each of said all other of said plurality of nodes having an address of a

6   purported master node, said handshake for each of said all other of said plurality of nodes

7   comprising:

8   first means for determining if said master node address in said update message

9   matches said address of said purported master node; and,

10   second means, responsive to operation of said first means determining no match

11   for rejecting said update message.

12

13   104.   The system of claim 103 and further comprising:

14   third means, responsive to operation of said first means determining a match, for

15   determining if said version number of said contents of said DDB in said node matches

16   said version number of said contents of said DDB in said master node before said update

17   message; and,

18   fourth means, responsive to operation of said third means determining no match

19   between said node DDB contents version number and said master node DDB contents

20   version number, for accepting said update message into said DDB of said node and for

21   replacing said contents of said DDB of said node with said contents of said DDB of said

22   master node.

23

1   105.   The system of claim 104 and further comprising:

2   fifth means, responsive to operation of said third means determining a match

3   between said node DDB contents version number and said master node DDB contents

4   version number, for accepting only that portion of said update message into said DDB of

5   said node which is different from said contents of said DDB of said node.

6

7   106.   The system of claim 105 and wherein said contents of said DDB of said master

8   node reflects said update message as updated contents, said portion of said update

9   message including said version number of said updated contents.

10

11   107.   The system of claim 106 and wherein said version number is changed for each

12   said update message.

13

14

15   108.   A computer program product for use in a computer network having a plurality of

16   nodes each of which has a DDB and one of which is a master node used to maintain

17   contents of said DDB in each of said plurality of nodes consistent throughout said

18   plurality in a manner to avoid a single point of failure, said computer program product

19   including a computer usable medium having computer readable program code thereon for

20   handling failure of said master node, said program code comprising:

21   program code for selecting another of said plurality of nodes as new master node

22   if said master node becomes a failed master node; and,

1   said new master node including program code for advising each of said all other

2   of said plurality of nodes of identity and authority of said new master node.

3

4   109.   The computer program product of claim 108 and wherein:

5   said selecting mean includes a GUI by which a global administrator can appoint

6   said new master node.

7

8   110.   The computer program product of claim 109 and wherein said advising program

9   code comprises:

10   program code for detecting failed and potentially failed nodes in said plurality of

11   nodes; and,

12   program code for pinging each one of said failed and potentially failed nodes until

13   said each one of said failed and potentially failed nodes recovers into a recovered node ;

14   and,

15   program code for updating said contents of said DDB in said recovered node to

16   match said contents of said DDB of said new master node.

17

18   111.   The computer program product of claim 110 and wherein said updating program

19   code includes program code for handshaking between said new master node and said

20   recovered node.

21

1   112.   The computer program product of claim 111 and wherein said failed nodes

2   include said failed master node and said potentially failed nodes include any other of said

3   plurality of nodes having a failed network link to said master node.

4

5

6   113.   A computer program product for use in a computer network having a plurality of

7   nodes each of which has a DDB and one of which is a master node used to maintain

8   contents of said DDB in each of said plurality of nodes consistent throughout said

9   plurality in a manner to avoid a single point of failure, said computer program product

10   including a computer usable medium having computer readable program code thereon for

11   handshaking between an inquiring node of said plurality and said master node, said

12   program code comprising:

13   program code for obtaining the address of a first node in said plurality presumed

14   by said inquiring node to be said inquiring node's master; and,

15   first program code for determining from said first node if said first node is said

16   inquiring node's master.

17

18   114.   The computer program product of claim 113 and wherein said computer program

19   product further comprises:

20   second program code, responsive to operation of said first program code

21   determining that said first node is not said inquiring node's master, for inquiring of said

22   first node who is new master for said inquiring node; and,

1   third program code responsive to operation of said second program code

2   determining said new master, for providing address of said new master to said inquiring

3   node.

4

5   115.   The computer program product of claim 113 and wherein said computer network

6   is controlled by a global administrator acting through a GUI, said computer program

7   product further comprising:

8   fourth program code, responsive to operation of said second program code not

9   determining said new master, for deciding to request said global administrator to

10   configure information identifying said new master for said inquiring node; and

11   fifth program code, responsive to operation of said fourth program code deciding

12   to request said global administrator to configure information identifying said new master,

13   for providing such information to said inquiring node.

14

15   116.   The computer program product of claim 115 and wherein said second program

16   code includes iteration program code, responsive to operation of said fourth program

17   code deciding not to request said global administrator to configure information

18   identifying said new master, for causing said operation of said second program code to

19   repeat.

20

21   117.   The computer program product of claim 113 and wherein said address is an IP

22   address.

23

1

2   118.   A computer program product for use in a computer network configuration having

3   a plurality of nodes each of which has a DDB, contents of said DDB including its

4   respective DDB version number, and one of which is a master node used to maintain said

5   contents in each of said plurality of nodes consistent throughout said plurality in a

6   manner to avoid a single point of failure, said DDB in each of said all other of said

7   plurality of nodes having an address of a purported master node, said computer program

8   product including a computer usable medium having computer readable program code

9   thereon for handshaking initiated as a function of said master node undertaking to

10   provide an update message including address of said master node to all other of said

11   plurality of nodes in response to a change to said network configuration, said program

12   code for each of said all other of said plurality of nodes comprising:

13   first program code for determining if said master node address in said update

14   message matches said address of said purported master node;

15   second program code, responsive to operation of said first program code

16   determining no match for rejecting said update message.

17

18   119.   The computer program product of claim 118 and further comprising:

19   third program code, responsive to operation of said first program code

20   determining a match, for determining if said version number of said contents of said

21   DDB in said node matches said version number of said contents of said DDB in said

22   master node before said update message; and,

1   fourth program code, responsive to operation of said third program code

2   determining no match between said node DDB contents version number and said master

3   node DDB contents version number, for accepting said update message into said DDB of

4   said node and for replacing said contents of said DDB of said node with said contents of

5   said DDB of said master node.

6

7   120.   The computer program product of claim 119 and further comprising:

8   fifth program code, responsive to operation of said third program code

9   determining a match between said node DDB contents version number and said master

10   node DDB contents version number, for accepting only that portion of said update

11   message into said DDB of said node which is different from said contents of said DDB of

12   said node.

13

14   121.   The computer program product of claim 120 and wherein said contents of said

15   DDB of said master node reflects said update message as updated contents, said portion

16   of said update message including said version number of said updated contents.

17

18   122.   The computer program product of claim 121 and wherein said version number is

19   changed for each said update message.

20

21

22   123.   In a computer network having a plurality of nodes each of which has a DDB and

23   one of which is a master node used to maintain contents of said DDB in each of said

1   plurality of nodes consistent throughout said plurality in a manner to avoid a single point

2   of failure, a method for handling failure of said master node comprising:

3   selecting another of said plurality of nodes as new master node if said master node

4   becomes a failed master node; and,

5   advising each of said all other of said plurality of nodes of identity and authority

6   of said new master node.

7

8   124.   The method of claim 123 and wherein:

9   said selecting includes using a GUI by which a global administrator can appoint

10   said new master node.

11

12   125.   The method of claim 124 and wherein said advising comprises:

13   detecting failed and potentially failed nodes in said plurality of nodes; and,

14   pinging each one of said failed and potentially failed nodes until said each one of

15   said failed and potentially failed nodes recovers into a recovered node ; and,

16   updating said contents of said DDB in said recovered node to match said contents

17   of said DDB of said new master node.

18

19   126.   The method of claim 125 and wherein said updating includes handshaking

20   between said new master node and said recovered node.

21

1   127.   The method of claim 126 and wherein said failed nodes include said failed master

2   node and said potentially failed nodes include any other of said plurality of nodes having

3   a failed network link to said master node.

4

5

6   128.   In a computer network having a plurality of nodes each of which has a DDB and

7   one of which is a master node used to maintain contents of said DDB in each of said

8   plurality of nodes consistent throughout said plurality in a manner to avoid a single point

9   of failure, a method for handshaking between an inquiring node of said plurality and said

10   master node comprising:

11   obtaining the address of a first node in said plurality presumed by said inquiring

12   node to be said inquiring node's master; and,

13   determining from said first node if said first node is said inquiring node's master.

14

15   129.   The method of claim 128 and wherein said method further comprises:

16   if said first node is not said inquiring node's master, inquiring of said first node

17   who is new master for said inquiring node; and,

18   if said new master is determined from said first node, providing address of said

19   new master to said inquiring node.

20

21   130.   The method of claim 128 and wherein said computer network is controlled by a

22   global administrator acting through a GUI, said method further comprising:

1   if said new master is not determined from said first node, deciding whether or not

2   to request said global administrator to configure information identifying said new master

3   for said inquiring node; and

4   if said global administrator is requested to configure information identifying said

5   new master, providing such information to said inquiring node.

6

7   131.   The method of claim 130 and wherein said method further comprises:

8   if said global administrator is not requested to configure information identifying

9   said new master, repeating said inquiring of said first node who is new master for said

10 inquiring node.

11

12 132.   The method of claim 128 and wherein said address is an IP address.

13

14

15 133.   In a computer network configuration having a plurality of nodes each of which

16 has a DDB, contents of said DDB including its respective DDB version number, and one

17 of which is a master node used to maintain said contents in each of said plurality of nodes

18 consistent throughout said plurality in a manner to avoid a single point of failure, a

19 master to node handshake method initiated as a function of said master node undertaking

20 to provide an update message including address of said master node to all other of said

21 plurality of nodes in response to a change to said network configuration, said DDB in

22 each of said all other of said plurality of nodes having an address of a purported master

1   node, said handshake method for each of said all other of said plurality of nodes

2   comprising:

3   determining if said master node address in said update message matches said

4   address of said purported master node;

5   if no match, rejecting said update message.

6

7   134.   The method of claim 133 and further comprising:

8   if a match, determining if said version number of said contents of said DDB in

9   said node matches said version number of said contents of said DDB in said master node

10   before said contents of said DDB in said master node conformed to said update message;

11   and,

12   if no match between said node DDB contents version number and said master

13   node DDB contents version number, accepting said update message into said DDB of

14   said node.

15

16   135.   The method of claim 134 and further comprising:

17   if a match between said node DDB contents version number and said master node

18   DDB contents version number, accepting only that portion of said update message into

19   said DDB of said node which is different from said contents of said DDB of said node.

20

21   136.   The method of claim 135 and wherein said contents of said DDB of said master

22   node reflects said update message as updated contents, said portion of said update

23   message including said version number of said updated contents.

1

2   137.   The method of claim 136 and wherein said version number is changed for each

3   said update message.

4

5

6   138.   In a computer network having a plurality of nodes for interacting with computer

7   network information, apparatus for managing said plurality of nodes comprising:

8   apparatus that establishes a DDB in each of said nodes; and,

9   apparatus that controls contents of each said DDB to be substantially identical to

10   contents of every other said DDB and in a manner to avoid a single point of failure.

11

12

13   139.   In a computer network having a plurality of nodes each of which has a DDB and

14   one of which is a master node used to maintain contents of said DDB in each of said

15   plurality of nodes consistent throughout said plurality in a manner to avoid a single point

16   of failure, apparatus for handling failure of said master node comprising:

17   GUI apparatus that selects another of said plurality of nodes as new master node if

18   said master node becomes a failed master node; and,

19   said new master node including apparatus that advises each of said all other of

20   said plurality of nodes of identity and authority of said new master node.

21

22

1   140.   In a computer network having a plurality of nodes each of which has a DDB and

2   one of which is a master node used to maintain contents of said DDB in each of said

3   plurality of nodes consistent throughout said plurality in a manner to avoid a single point

4   of failure, handshaking apparatus utilized between an inquiring node of said plurality and

5   said master node comprising:

6   apparatus that obtains the address of a first node in said plurality presumed by

7   said inquiring node to be said inquiring node's master; and,

8   apparatus that determines from said first node if said first node is said inquiring

9   node's master.

10

11

12   141.   In a computer network configuration having a plurality of nodes each of which

13   has a DDB, contents of said DDB including its respective DDB version number, and one

14   of which is a master node used to maintain said contents in each of said plurality of nodes

15   consistent throughout said plurality in a manner to avoid a single point of failure, master

16   to node handshake apparatus activated as a function of said master node undertaking to

17   provide an update message including address of said master node to all other of said

18   plurality of nodes in response to a change to said network configuration, said DDB in

19   each of said all other of said plurality of nodes having an address of a purported master

20   node, said handshake apparatus for each of said all other of said plurality of nodes

21   comprising:

22   first apparatus that determines if said master node address in said update message

23   matches said address of said purported master node; and,

1   second apparatus, responsive to operation of said first apparatus determining no

2   match that rejects said update message.

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